Peer Review of Marine Mammal Assessment

North Western Mussels Ltd - Resource Consent Application

Waikato Regional Council

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Making Sustainability Happen

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Basis of Report

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Appendix A Central West Coast, North Island IMMA

Acronyms and Abbreviations

ADL	Aquaculture Direct Limited
AEE	Assessment of Environmental Effects
CMA	Coastal Marine Area
DOC	Department of Conservation
IMMA	Important Marine Mammal Area
NWML	North Western Mussels Limited
NZCPS	New Zealand Coastal Policy Statement
PAM	Passive Acoustic Monitoring

1.0 Introduction

A resource consent application has recently been lodged with the Waikato Regional Council by North Western Mussels Limited (**NWML**) (the applicant). This application seeks to develop a new 700-hectare marine farm incorporating spat catching and nursery operations over four separate sites in the Tasman Sea off the west coast of the Waikato region (near Raglan). The proposed marine farm structures would be installed at least 3.1 km from the coastline between Papanui Point in the south and Parikotuku Point in the north (**Figure 1**). Sites A to C are proposed for locations approximately 20 km north of Raglan Harbour, with Site D approximately 10 km to the south of the harbour entrance. All structures would be deployed in a water depth of 20 - 40 m.

The proposal includes both spat catching and spat holding until the optimum conditions have been reached for it to be transferred to the final grow out site. Spat holding (or nursery activities) would involve both spat that is caught onsite and spat that is sourced from a hatchery and then seeded onto lines at the proposed farm sites. Consent is not being sought to grow mussels to harvest size. The purpose of the proposed marine farm is therefore threefold, to 1) Catch green-lipped mussel (*Perna canaliculus*) spat; 2) Seed bio-secure hatchery spat; and 3) Operate a mussel nursery for juvenile mussels of an average size of 70 mm, and up to a maximum size of 90 mm.

Spat holding activities aim to increase the survival rate of juvenile mussels once they are relocated to their final cultivation site (most likely at existing mussel cultivation farms in the Hauraki Gulf). Overall, the four proposed farm sites (or blocks) will consist of 11 rows (three rows each for Sites A-C separated by 300 m, and two rows for Site D separated by 400 m) with a total of 451 individual longlines. The cumulative area of occupation is presented in **Table 1** and includes the space between lines in each row. Each row at Sites A, B and C will have 41 lines (e.g. **Figure 2**). Row 1 of Site D will have 31 lines and Row 2 of Site D will have 51 lines. The lines in each row will run parallel to the coast and be 50 m apart.

Each line will consist of a 150 m backbone line (40 mm diameter) suspended approximately 3 m below the sea surface by 300 L floats at 2-10 m intervals. The backbone line will be secured to the seafloor by a mooring warp (28-75 m long depending on water depth and 44 mm diameter) attached to a screw anchor at either end. From the backbone line the weighted and filamentous dropper lines will be hung. It is proposed that each dropper line is approximately 8 m in length with 60-80 mm cut pile filaments. Dropper lines will be attached at each end to the backbone line to form a continuous spat catching/holding rope. Installation will occur over two stages; with half of each site being installed initially, followed by a period of assessment before the second instalment to completion.

This memorandum provides a peer review of the assessment of effects on marine mammals prepared by Jim Roberts, Anemone (Roberts, 2023). The Roberts (2023) assessment was included as a component of the Assessment of Environmental Effects (**AEE**) submitted with the application. This peer review specifically addresses the following considerations:

- Is the existing environment appropriately described?
- Have relevant effects on marine mammals been identified?

- Is the effects assessment robust and can it be relied on?
- Do you agree with the conclusions including identified level of effect?
- Is mitigation to address effects proposed and/or considered necessary? If so, is the proposed mitigation appropriate and effective to address effects?
- Is further information required to ensure a robust assessment of effects on marine mammals?

Figure 1 Proposed Location of New Spat Nursery Farm Structures

Table 1 Cumulative Total Area of Proposed Farm

	Site A	Site B	Site C	Site D	
Row 1	60 ha	60 ha	60 ha	60 ha	
Row 2	60 ha	60 ha	60 ha	100 ha	
Row 3	60 ha	60 ha	60 ha		
Total	**180 ha**	**180 ha**	**180 ha**	**160 ha**	**700 ha**

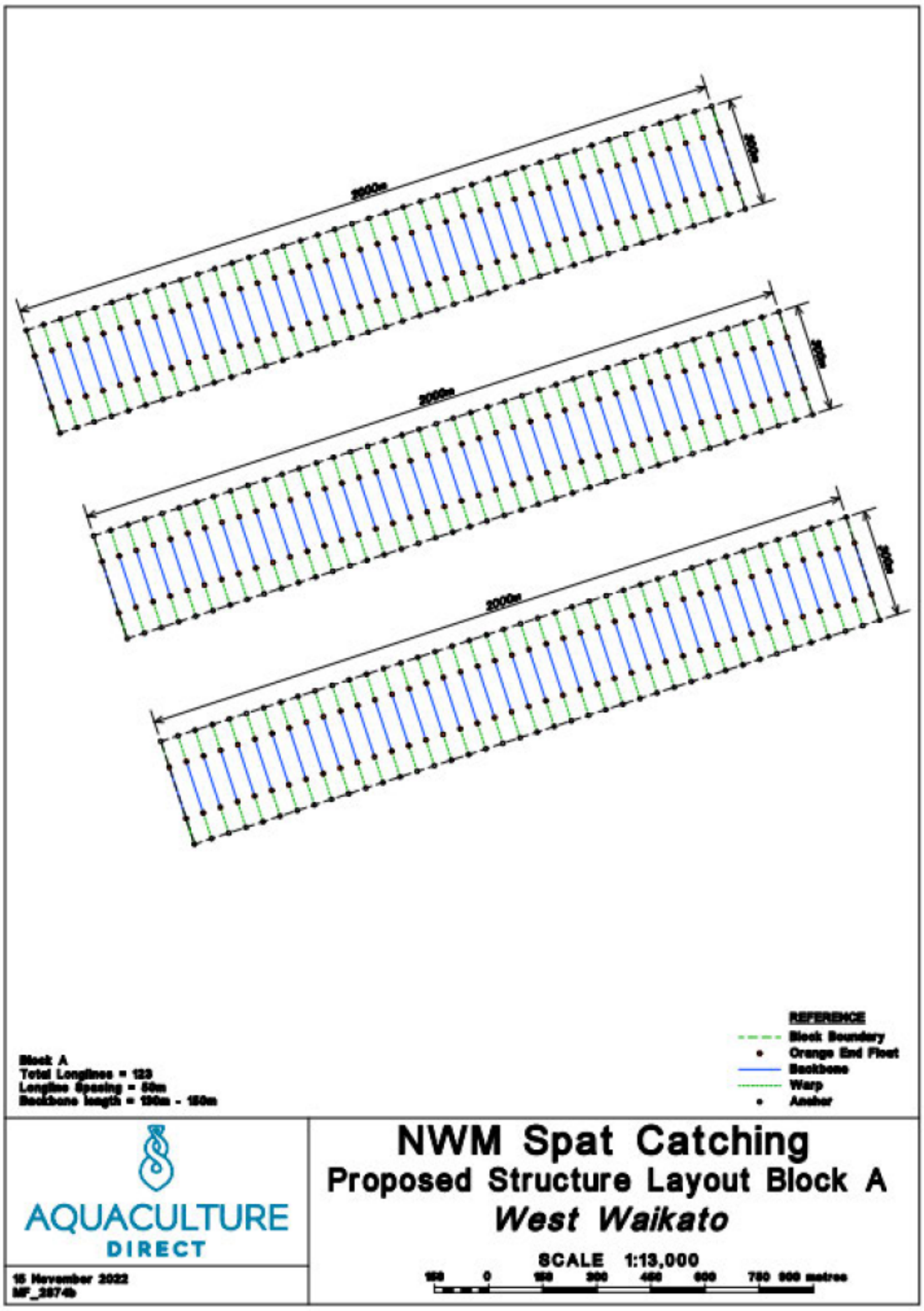

Figure 2 Proposed Structure Layout using Site A as an Example

2.0 Reference Documents

The following application documents have been reviewed and inform this technical review.

- NWML Coastal Permit Application. Part B Assessment of Environmental Effects prepared by Aquaculture Direct Limited (**ADL**), dated May 2023 (henceforth referred to as the **AEE**).
- Schedule A - Maps and Plans.
- Schedule E - Anemone Marine Mammal Assessment entitled: Marine Mammal Assessment with Respect to the Potential Effects of Proposed Mussel Spat Catching and Nursery Activities off the coast of Raglan. Prepared for NWML by Jim Roberts, Anemone (henceforth referred to as Roberts, 2023).

3.0 Existing Environment – Marine Mammals

A description of marine mammal species that commonly use the proposed farm sites and surrounds is provided in Section 3 of Roberts (2023). While I largely concur with this description, the methodology that was used to predict species presence here is not immediately clear.

Roberts (2023) appears to have largely relied on a literature review prepared for NWML by Cawthron Institute (Pavanato & Clement, 2022) to determine what species could be present, stating that:

> *"Pavanato and Clement (2022) identified four marine mammal species commonly occurring near to Raglan: Hector's dolphin (Cephalorhynchus hectori), most notably the Māui dolphin sub-species, but also potentially South Islands Hector's dolphin (Cephalorhynchus hectori hectori); common dolphin (Delphinus delphis); orca / killer whale (Orcinus orca); and southern right whale (Eubalaena australis)."*

Given the strong reliance on the Cawthron Report, its inclusion as an appendix would have been useful, particularly with regard to understanding the methodology used.

In addition to the four species mentioned by Pavanato and Clement (2022), Roberts (2023) also indicates that New Zealand fur seals and humpback whales are of relevance to the proposed marine farm locations. I note that for Māui/ Hector's dolphins, common dolphins, killer whales, blue whales, humpback whales and southern right whales, it is helpful that data from the Department of Conservation's (**DOC**) Marine Mammal Sightings Database are mapped in Appendix B of Roberts (2023).

In lieu of any project-specific baseline monitoring for marine mammals, the typical way in which species occurrence is predicted for any given project site (including a large surrounding buffer) is via an assessment of the DOC Marine Mammal Sightings and Stranding Databases and consideration of any other relevant marine mammal survey results, habitat modelling or other relevant scientific literature. While this method is not specifically stated, Roberts (2023) does reference several of these data sources throughout Section 3 and an area larger than the proposed farm sites is considered in keeping with accepted methodology.

To cross check the list of relevant marine mammal species identified by Roberts (2023), I reference a recent analysis that I undertook of the DOC marine mammal Sightings and Strandings Databases in respect of the Waikato Coastal Marine Area (**CMA**). My findings are reproduced in **Table 2**.

Table 2 Species of marine mammal that may occur in the Waikato CMA

	Species	No. of strandings reported	No. of sightings reported
Baleen whales	Blue whale	2	0
	Bryde's whale	0	1
	Southern right whale	0	4
	Humpback whale	1	1
	Minke whale	2	0
	Pygmy right whale	1	0
Odontocetes – toothed whales and dolphins	Hector's and Māui's dolphin	13	414
	Common dolphin	24	80
	Killer whale (orca)	2	6
	False killer whale	1	0
	Pilot whale	4	0
	Striped dolphin	2	0
	Beaked whale - Andrew's	2	0
	Beaked whale - Cuvier's	6	0
	Beaked whale - Gray's	9	0
	Beaked whale - Shepherd's	1	0
	Beaked whale - species unknown	4	0
	Southern bottlenose whale	1	0
	Sperm whale	5	0
	Pygmy sperm whale	13	0

In relation to the DOC data that underpins **Table 2**, it is noteworthy that data gaps in sightings records may not necessarily indicate an absence of cetaceans but can simply reflect a lack of observation effort. Further to this, while stranding data gives a broad indication of species occurrence, dead animals can wash ashore well away from where they died; and sick or diseased animals may be outside of their normal range prior to death. In particular, and despite reasonable numbers of stranding records for some species that are not represented in the sighting's records (e.g. beaked whales), these are primarily deep water open ocean species that would be unlikely to have any consistent presence around the proposed marine farm sites.

While both data sets (sightings and strandings) therefore have their limitations, greater emphasis is typically placed on the sightings data as stranding data should be interpreted with caution for the reasons outlined above. On this basis my findings in **Table 2** concur with the description of the existing environment provided by Roberts (2023) that the following species are expected to occur in the vicinity of the proposed farm sites:

- Māui/Hector’s dolphins (odontocete);
- Common dolphins (odontocete);
- Killer whales (odontocete);
- Southern right whales (baleen whale);
- Humpback whales (baleen whale); and
- New Zealand fur seals (pinniped).

Roberts (2023) summarises important ecological information for each of these species including highly relevant information about seasonality, habitat use (in particular breeding, feeding and migratory behaviours), population trends and threat status.

The ecological information presented for the ‘nationally critical’ Māui dolphins is particularly thorough and summarises all known data sources to describe Māui dolphin range (e.g. boat-based sighting and genetic surveys, aerial surveys, acoustic monitoring and habitat modelling). That the proposed marine farm sites are within the core range for this subspecies and validated sightings have been made in the vicinity of all four proposed farm sites is a critical observation and is the foremost marine mammal consideration with regard to the NWML consent application.

The predicted at-sea density of Māui dolphins is presented for different seasons and different cohorts in Figures 2 and 3. While these density maps provide excellent fine-scale predictions about expected dolphin distribution, interpretation of these figures is complicated slightly by the different colour coding of the density scales between seasons; however Roberts (2023) acknowledges this in his report and I find no fault with the interpretation given that the densities of Māui dolphins are, generally speaking, predicted to be low (in keeping with the very low population size of this subspecies), but that modelled density data suggests that highest densities in summer occur directly off Raglan Harbour entrance and along the coast to the north of the harbour entrance in water depths of at least 20 m in winter. It is helpful that predicted at-sea densities for groups containing juveniles were presented separately and indicates that juveniles are most commonly seen to the south of Raglan Harbour.

Appropriate ecological descriptions are also provided for common dolphins, killer whales, southern right whales, humpback whales and New Zealand fur seals, using relevant and up-to-date scientific literature. A small discussion is also included on blue whales; and while Roberts (2023) correctly notes that blue whale sightings are not uncommon off the west coast of the North Island, blue whale sightings off Waikato all occur beyond the CMA; hence I consider that this species has little relevance to this proposed marine farm.

Of relevance to this application, and in terms of the New Zealand Coastal Policy Statement (**NZCPS**), Roberts (2023) identifies several NZCPS policy 11(a) species[1] that are likely or will possibly be present in the Waikato CMA. These species are listed below. Policy 11 of the NZCPS requires effects on these species be avoided.

- Māui/Hector's dolphins (NZCPS Policy 11(a)(i) species; Māui dolphin classified as 'threatened - nationally critical', and Hector's dolphin classified as 'threatened – nationally vulnerable' by the NZTCS);
- Killer whales (NZCPS Policy 11(a)(i) species; classified as 'threatened - nationally critical' by the NZTCS);
- Southern right whale (NZCPS Policy 11(a)(i) species; classified as 'at risk – recovering' by the NZTCS); and
- Humpback whale (NZCPS Policy 11(a)(ii) species; classified as 'endangered' by the IUCN[2]).

Policy 11 of the NZCPS also requires that significant effects on important habitat during vulnerable life stages, (Policy 11(b)(ii)), and important habitat to migratory species (Policy 11(b)(v)) be avoided, and other adverse effects avoided, remedied, or mitigated.

In summary, and in circumstances when project specific baseline monitoring has not been conducted, knowledge of marine mammal distribution is typically amassed over long temporal periods utilising a combination of data collection techniques (e.g., stranding data, opportunistic sightings, systematic survey data, etc.). It is therefore important to assess multiple data sources when considering marine mammal distribution. As inferred earlier, Roberts (2023) has indeed used a suite of data sources that represent the best available information on marine mammal distribution along the Waikato coastline. Hence despite some uncertainty regarding the methodology used, a cross check against my own knowledge of the region confirms that all relevant marine mammal sensitivities in the area have been identified and appropriately described.

There is no doubt that Māui's dolphins are of high relevance to this consent application given 1) the overlap between their core distribution and the Waikato CMA, and 2) their 'nationally critical' threat status. While Roberts (2023) outlines the boundaries of the West Coast North Island Marine Mammal Sanctuary and the associated restrictions on marine industry in the sanctuary, he overlooks that the entire Waikato CMA has recently been identified as an Important Marine Mammal Area (**IMMA**) based on the recommendations of the International Union for Conservation of Nature's 'Marine Protected Area Task Force'. This task force has

[1] Indigenous taxa that are identified as 'threatened' or 'at risk' in the New Zealand Threat Classification System (NZTCS) (NZCPS Policy 11(a)(i)); or Taxa listed by the IUCN as 'threatened' (NZCPS Policy 11(a)(ii)) or Habitats of indigenous species where the species are at the limit of their natural range or are naturally rare (NZCPS Policy 11(a)(iv)).

[2] Childerhouse et al, (2008), also see https://www.iucnredlist.org/species/132832/3463914

identified several areas of coastal New Zealand as Important Marine Mammal Areas based on their importance to marine mammals. All proposed marine farm sites fall within the Central West Coast, North Island IMMA (**Figure 3**) and while this doesn't confer any specific management requirements, it should be acknowledged in relation to any description of marine mammal habitat in the region.

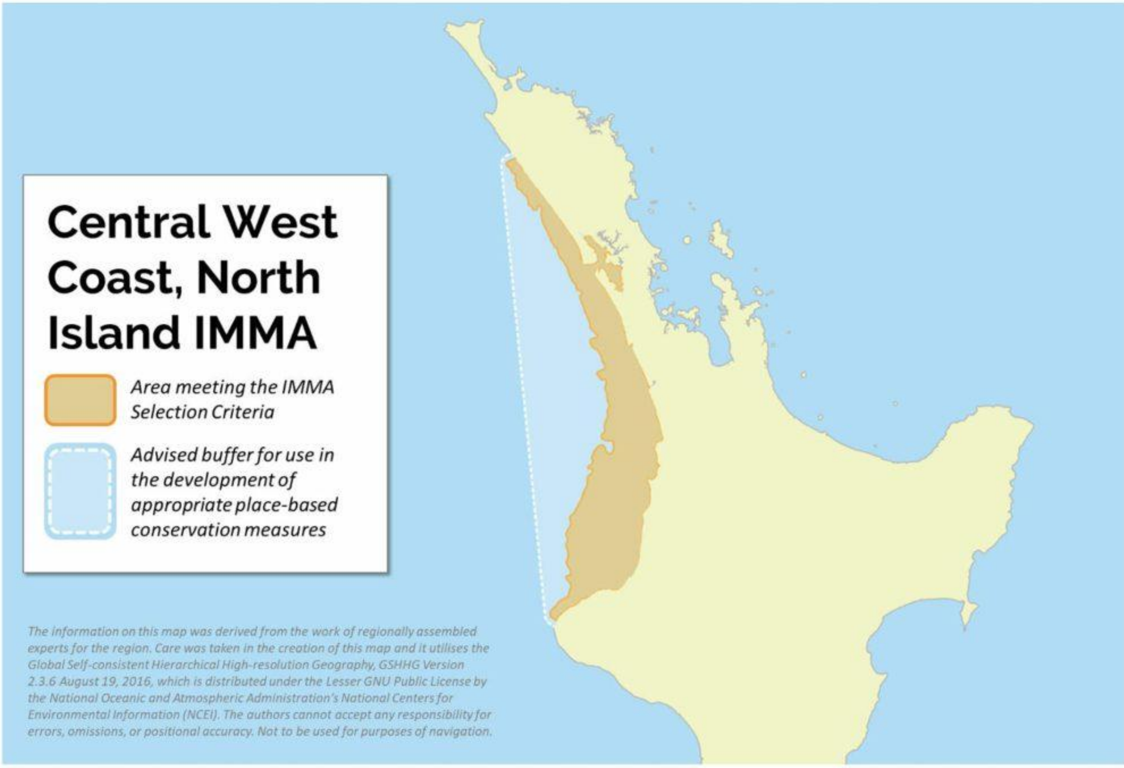

Figure 3 The Central West Coast Important Marine Mammal Area

The Central West Coast IMMA is designated on account of the following criteria and further detail is provided in **Appendix A**:

- <u>Criterion A – Species or Population Vulnerability</u>

"This IMMA includes the only currently occupied year-round habitat of Critically Endangered (IUCN Red List) Māui dolphins (Oremus et al. 2012, Derville et al. 2016, Constantine et al. 2021, Roberts et al. 2019a). Their current range is extremely limited compared to their historical range (Dawson et al. 2001). Māui dolphins have been isolated by ~15,000 years from the South Island Hector's dolphins (Baker et al. 2002) and their unique haplotype most likely resulted from a population bottleneck and small home range (Oremus et al. 2012, Pichler & Baker 2000). Their core range has decreased since the 1970s (Russell 1999, Constantine et al. 2021)."

- <u>Criterion B – Distribution & Abundance (B1: small & resident populations)</u>

"The entire known range of the Māui dolphin is included in this IMMA. This is a small population (54 dolphins aged 1+ 95% CI – 48-66) facing threats from disease and fisheries bycatch (Constantine et al. 2021, Cooke et al. 2018, Roberts et al. 2019a, Roberts et al.

2021). Individuals have small home ranges averaging 35.5 km, with a maximum range of 80 km recorded for one individual (Oremus et al. 2012). A genetic and photo-identification database has identified dolphins up to 20 years after their initial identification highlighting long-term site fidelity. In 2010, there were two female Hector's dolphins genetically identified swimming with Māui dolphins within this IMMA; one of the females was identified again in 2011 and 2020 so remained with the Māui dolphins (Hamner et al. 2014, Constantine et al. 2021). This was considered an extraordinary event, but in 2015 and 2020, two different male Hector's dolphins were also genetically identified with Māui dolphins suggesting long-range movements by Hector's dolphins from the South Island may become a more regular occurrence (Constantine et al. 2021). Surveys have been mostly conducted in summer months with neonates and calves observed in this region. Groups containing calves are larger than non-calf groups. These nursery groups contain male and female adults which differs from Hector's dolphins (Oremus et al. 2012)."

4.0 Assessment of Effects – Marine Mammals

A thorough understanding of the relevant literature pertaining to the effects of shellfish farming on marine mammals is demonstrated by Roberts (2023) and all key national and international reviews of this topic have been referenced.

The following potential effects of the proposed activity on marine mammals have been identified, described and assessed by Roberts (2023):

- Entanglement;
- Habitat Exclusion;
- Trophic Effects;
- Marine Debris;
- Vessel strike;
- Underwater noise; and
- Cumulative effects.

In my opinion all actual and potential effects have been identified, and the emphasis that Roberts (2023) puts on entanglement and habitat exclusion are warranted.

With regard to assessment methodology, I note that Roberts (2023) used the following process to qualitatively evaluate the relative magnitude of each potential effect in the context of marine mammal populations that could be affected by the proposed marine farm:

1 A review of national and international literature for each potential effect is presented in Section 4 of Roberts (2023) to predict the ways in which the proposed activities will affect marine mammals;

2 An assessment of the magnitude of each potential effect in terms of ecological significance to marine mammal populations is presented in Section 5 of Roberts (2023), resulting in effects being classified into the following categories broadly following McConnell (2019):

<u>Negligible</u> - the activity may have an effect, but this is unlikely to be detectable[3] or of ecological significance to marine mammal populations;

<u>Minor</u> - the activity may have a detectable effect, but this was considered to be of low ecological significance to marine mammal populations; or

<u>Moderate</u> - the activity would have a detectable effect, and this was considered to be of moderate ecological significance to marine mammal populations.

3 Management and monitoring actions that are proposed to mitigate risks to marine mammals are then proposed in Section 6 of Roberts (2023).

This methodology follows that of other similar assessments of environmental effects for marine mammals that have been undertaken recently for New Zealand coastal aquaculture proposals (Clement & Elvines, 2019; McConnell, 2019). On this basis, it is largely in keeping with accepted best practice procedures that are commonly used in New Zealand to conduct impact assessments of aquaculture projects on marine mammals. The methodology is, therefore, robust and fit for the purpose.

While not specifically stated, it appears that the magnitude classifications allocated for each potential effect have been determined assuming implementation of the proposed mitigation measures. This is an important assumption as without the proposed mitigations in place the effects would presumably be greater. In this regard, a statement confirming that this is the approach used should have been included by Roberts (2023) along with definitions for the terms ‘low’ and ‘moderate’ ecological significance, noting that in previous assessments of effects I have quantified these through predicted changes in population size or percent of habitat affected (following MacDiarmid et al., 2014).

The key assessment findings from Roberts (2023) and my technical review of these findings are outlined under the sub-headings below.

4.1 Entanglement

Section 4.1 of Roberts (2023) provides a good overview of the issue of potential marine mammal entanglement in shellfish farms, noting in particular that 1) entanglement risk is greater for thin and/or slack lines, 2) that despite over 40 years of mussel farming history in New Zealand few fatal entanglements have been reported, and 3) that of those fatal entanglements none have involved odontocetes (i.e. dolphins and toothed whales) or

[3] In Roberts (2023) ‘negligible was defined as “the activity may have an effect, but this is <u>unlikely to be undetectable</u> or of ecological significance to marine mammal populations. Following McConnell (2019) this should be “unlikely to be detectable”. This appears to be a simple transcription error.

pinnipeds (seals or sea lions). The observation of perhaps the greatest direct relevance to the risk of entanglement for Māui dolphins in the proposed aquaculture structure is that despite significant overlap between mussel farms and Hector's dolphins around Banks Peninsula, no entanglements of this species have been reported (Lloyd, 2003; Clement, 2013). Expanding on this it would be helpful to know how frequently spat collecting activities occur at this location.

Odontocetes echolocate to navigate and forage, and it is generally considered that echolocating marine mammals can effectively perceive mussel farm structures, and in most cases can navigate through or around them (Lloyd, 2003; Markowitz et al., 2004). However, because odontocetes do not echolocate all of the time, this ability does not completely eliminate entanglement risk (Würsig, 2020), but despite this and when considering that no entangled odontocetes have been reported from New Zealand mussel farms to date (DOC, 2023), the risk of entanglement is very low.

Of relevance to this application is that spat lines are comparatively light weight and under less tension compared to cultivation ropes that are taut under the growing product load (MPI, 2013; Price et al., 2017). In accordance with this, Roberts (2023) acknowledges that spat lines are considered to pose a greater risk of entanglement to medium-large whales than cultivation lines (MPI, 2013); noting that internationally most entanglements in spat lines involve baleen whales. While baleen whales don't echolocate, evidence suggests that they can detect and avoid lines in the water, for instance Kot et al. (2012) monitored the response of minke whales to vertical underwater ropes in a coastal environment and noted that individual whales slowed down and altered their bearing to avoid the rope. Despite the long history of the mussel industry in New Zealand and some overlap with existing farms and whale distribution, only two or three fatal baleen whale entanglements can be directly linked to shellfish farming (DOC, 2023). In addition, the Waikato CMA is not known to represent important feeding habitat for baleen whales, whereby feeding around farm structures can increase the risk of entanglement (Clement and Elvines, 2019; Segre et al., 2022).

A useful discussion is also included on the issue of marine mammal entanglements in craypot lines for both baleen whales and odontocetes; where 13 orca, four Hector's dolphins, two common dolphins one bottlenose dolphin, 51 humpback whales, five southern right whales, one Bryde's whale, one blue whale, one pygmy right whale and two unidentified baleen whales have reportedly been entangled in craypot lines in New Zealand (Pierre et al., 2022). While this discussion demonstrates craypots pose an entanglement risk to both odontocetes and baleen whales, Roberts (2023) concludes that the entanglement risk to marine mammals from craypot lines is greater on account of these lines typically being thinner[4], less densely distributed, and including a section of slack line at the sea surface. I agree with this observation.

A fundamental consideration with regard to the potential for marine mammals to become entangled in marine farms is that this effect (if it occurs) has a high chance of being fatal to the affected individual. On this basis, entanglement is one of the few potential effects from

[4] Craypot lines are typically 12-14 mm (NZRLIC, 2022) which is substantially thinner than the 60-80 mm dropper gauge proposed by NWML.

marine farms that can have direct population level consequences for marine mammals. In terms of the requirements of policy 11(a) of the NZCPS this has the potential to be significant.

Regarding the magnitude of any potential entanglement effect from the proposed farm, Roberts (2023) concluded that for Māui dolphins, the potential effects of entanglement will be minor as long as weighted spat lines are used (to ensure the spat droppers are negatively buoyant and detectable) and that all farm components are maintained under tension. I agree with this conclusion and note that there is only one record globally of a dolphin being caught in a spat line (a harbour porpoise in Iceland; see Price et al., 2017). On this basis, the likelihood of a Māui dolphin becoming entangled in the proposed farm structures is very low. The significant overlap between Hector's dolphin distribution and mussel farms at Banks Peninsula and the fact that no dolphin entanglements have been reported also supports this finding. It is however noteworthy that in the unlikely event that an individual Māui dolphin were to become fatally entangled in any proposed marine farm structure, then population level effects would ensue.

With regard to other marine mammal species, Roberts (2023) concluded that:

- Entanglement effects on common dolphins and killer whales will be minor so long as dropper lines are weighted and adequately tensioned. I agree with this conclusion.
- Entanglement effects on baleen whales will be minor so long as lines are adequately tensioned, and increased vigilance is afforded during migration periods. I agree with this conclusion but add that operational protocol that ensures increased vigilance for baleen whales is yet to be developed and will need to be incorporated into a Marine Mammal Management Plan (**MMMP**). Despite baleen whales having the highest chance of entanglement, I consider that the likelihood of entanglements can be minimised if the farm is well constructed and maintained. Population effects are therefore unlikely. It is also noteworthy that both humpback whales and southern right whale populations are showing signs of population recovery around New Zealand (Gibbs et al., 2018; Jackson et al., 2016); hence in the unlikely event that an individual whale dies as a result of entanglement, population level effects are not predicted.
- Entanglement effects on New Zealand fur seals will be negligible so long as lines are adequately tensioned. I agree with this conclusion as entanglement of this species is not predicted.

4.2 Habitat Exclusion

Section 4.2 of Roberts (2023) provides a brief discussion about the potential for marine mammals to be excluded from habitat on account of the location of marine farms. While Roberts (2023) provides several habitat exclusion examples for proxy species (dusky dolphins, Chilean dolphins and bottlenose dolphins), he notes that specific information on this effect is relatively scare for most New Zealand marine mammal species.

For the odontocete species expected in the Waikato CMA, I agree that there is limited information about how Māui's dolphin, common dolphins, and killer whales perceive and behave around shellfish farms. Common dolphins could be attracted to farms (Clement, 2013), while Visser (2007) noted that "New Zealand orca are known to avoid entering marine farms", but also confirms that from time to time they have been observed swimming inside mussel farms (Visser, 2020).

A useful and relevant discussion is provided for Hector's dolphins; whereby Valdēs Hernāndez (2021) investigated occurrence of dolphins (using acoustic detection data) in the vicinity of mussel farms around Banks Peninsula. This study found that detection rate decreased in bays with mussel farms and that when dolphins did occur inside a bay housing a mussel farm, dolphins were more frequently detected in areas of the bay away from the farm structures. This study provides valuable and specific information about how the proposed marine farm structures could affect the distribution of Māui dolphins; indicating that some habitat exclusion effects would be expected.

In the most part there is no evidence to suggest that the proposed farm sites represent habitat of higher relative importance to Māui dolphins (compared to alternative coastal habitat nearby). However, fine scale distribution data for this subspecies is limited so there are inherent challenges associated with assessing habitat significance. While I don't consider the potential for habitat exclusion to be an issue of particular concern for Sites A-C, potential exclusion of groups containing juvenile Māui dolphins from Site D could be more ecologically meaningful. Further discussion on this topic is warranted; although, I note that sightings of groups containing juveniles typically occur inshore of the proposed Site D during summer, so the attributes of this inshore area may be specifically important to mother/calf pairs.

Roberts (2023) concluded that for Māui dolphins the magnitude of potential habitat exclusion effects, will be minor on the basis that even though the along-shore extent of Māui dolphin home ranges are small (mean = 35.5 km; Oremus et el., 2012) the total proposed farm area (7 km^2) is small compared to the overall distributional range for the subspecies. I think this approach trivialises the potential effect on affected individuals. Instead, this assessment should consider that for individuals whose home range includes one or more of the farm sites, displacement from a substantial area of habitat could theoretically occur. However, the density data provided in Figures 2 and 3 of Roberts (2023), suggest that these displacement effects would be limited primarily to the winter months when dolphins are typically found further offshore (i.e. have a greater distributional overlap with the proposed farm sites). Given that the alongshore and offshore distribution for this subspecies increases in winter (Oremus, et al., 2012; Constantine, 2019), it follows that displacement in winter would be of lower relative concern as an individual's overall home-range is largest at this time.

Another simplistic way of conceptualising the potential impact on an individual dolphin would be to conservatively calculate the overall area of home range. For this I suggest using 35 km for the alongshore distribution (following Oremus et al., 2012); and 10 km as the minimum offshore distribution (following Nelson and Radford, 2019). From this, an overall home range of 350 km^2 can be approximated for any individual dolphin. The total farm area proposed is 7 km^2 which equates to 2% of an individual's available habitat. While this calculation does not consider habitat heterogeneity and variances in seasonal patterns of use, it does help with conceptualising the maximum potential area of displacement if a dolphin was excluded from all proposed farm sites.

On the basis of the discussion above, I agree with the conclusion that habitat exclusion effects from the proposed farm are likely to minor for Māui dolphins.

With regard to other marine mammal species, 1) I agree that habitat exclusion is unlikely to be an issue for baleen whales which have vast distributional ranges compared to the small area within which the proposed marine farm activities would be restricted; and 2) I agree that habitat exclusion effects will not be of concern for New Zealand fur seals. Roberts (2023) assigned a negligible magnitude to effects of habitat exclusion on all marine mammal species except for Māui dolphins. I agree with this conclusion, noting that the proposed farm sites occupy a relatively small spatial footprint compared to the home ranges of most marine mammals.

4.3 Trophic Effects

While the potential for marine farms to cause trophic effects for marine mammals has been recognised by Roberts (2023), he correctly notes that data is limited (e.g. Clement, 2013) and sometimes conflicting (e.g. Valdēz Hernāndez, 2021) about what this might mean for marine mammals that could forage in the vicinity of the proposed spat farm. Again, the species of most relevance to this discussion is Māui dolphin as the home-ranges of some resident individuals overlap with the proposed farm locations; hence any changes to prey availability or quality could have direct consequences for these individuals.

Roberts (2023) notes that there is some evidence to suggest that prey availability may already be limiting for Māui dolphins. On this basis any adverse effects to dolphin prey species must be thoroughly considered and this is challenging given the paucity of data available on this topic.

A recent study by Brough et al. (2023) found that the relative abundance of Hector's dolphins was positively correlated with prey abundance. This is common to many marine mammal species where prey is patchily distributed (e.g. Baumgartner et al., 2003; Fauchald, 2009; Benoit-Bird et al., 2013; Barlow et al., 2020).

Roberts (2023) concluded that potential trophic effects on Māui dolphins are likely to be of minor magnitude as benthic effects from spat farm activities are typically lower than those associated with mussel cultivation farms and the benthic habitat at the proposed farm locations has been characterised as "featureless muddy sand sea floor" implying that this habitat is unlikely to support Māui dolphin prey. The findings of Brough et al (2023) however indicate that Hector's dolphin abundance was negatively correlated with habitat heterogeneity, instead dolphins were more abundant in areas that were characterised by high sand cover, high prey abundance and high tidal flow. It is possible that these environmental attributes may also be important in driving the distribution of Māui dolphins.

These findings suggest that the proposed farm sites possibly represent existing foraging habitat for Māui dolphins; hence some trophic effects from the proposed marine farms should be expected and these could be positive (aggregation of prey species in and around the proposed farm structures) or negative (displacement of prey species from within farm structures). On balance, I agree with Roberts (2023) that any tropic effects on Māui dolphins are likely to be minor. Noting also that if prey availability decreases as a result of farm establishment, the area of lost foraging habitat is relatively small (see my previous discussion re habitat exclusion).

I agree that trophic effects on other marine mammal species are likely to be negligible.

4.4 Marine Debris

Potential marine debris effects from the proposed marine farm are discussed by Roberts (2023) in Section 4.4. For all marine mammal species (including Māui dolphins) these effects are considered to be negligible as long as high-quality UV stabilised rope products are used on the farm and that all structures (including ropes) are regularly inspected and maintained or replaced as required.

I agree with this conclusion and note that when these management procedures are coupled with effective waste management strategies, the potential for non-biodegradable waste to be lost from marine farms to the surrounding environment is very low.

4.5 Vessel Strike

A brief discussion regarding the potential effects associated with vessel strike is given by Roberts (2023) in Section 4.5. This discussion highlights that vessel strike tends to be particularly problematic when the distribution of large whales overlaps with shipping routes used by large, fast vessels. While operational vessels used by marine farms are typically smaller than those that are responsible for most large whale fatalities (>80 m; Laist et al., 2001; Jensen & Silber, 2003), small coastal odontocetes are also at risk of vessel strike, and typically such incidents involve small to medium sized vessels that often have a consistent presence in urbanised coastal waters (Schoeman et al., 2020). Indeed, even small vessels (<15 m) can cause fatal injury particularly when they are being operated at high speeds (Ritter, 2012). When vessels are travelling fast, the rate of detection of marine mammals decreases, increasing the chance of collision (Gende et al., 2011). Reduction in vessel speed is one of the best recognised mitigations to avoid vessel strike.

As outlined by Roberts (2023) Hector's dolphins around Banks Peninsula have been subject to vessel strike in the past, and mothers with young calves may be particularly vulnerable (Stone & Yoshinaga, 2002). Given the increased probability of juveniles being present to the south of Raglan Harbour, particular care is warranted when vessels are operating at this site and when in transit to and from Raglan.

Roberts (2023) recommends several mitigation measures to minimise the probability of vessel strike with Māui dolphins. These mitigations include 1) compliance with the Marine Mammal Protection Regulations 1992 (a legal requirement); 2) restricting farm vessel speeds to ≤ 12 knots in areas where Māui dolphins are most likely to occur and especially between Raglan and Site D which is where most sightings of groups containing juveniles have been reported from; 3) further restricting vessel speeds to ≤10 knots or the speed of the slowest marine mammal when within 300 m of Māui dolphins; and 4) maintaining extra vigilance during the Māui dolphin breeding period of November to February. These recommendations are pragmatic and align with the best practice mitigations for reducing vessel strike risk (following Schoeman et al., 2020). To reduce confusion and given that all farm sites occur in Māui dolphin core range, I recommend that the ≤12 knot speed restriction be always adopted by all farm vessels. If these recommendations are implemented then I agree that the magnitude of effect, as it relates to vessel strike, can be managed to a minor level.

For other marine mammals Roberts (2023) assesses the vessel strike as being of negligible magnitude as long as farm vessels do not exceed 12 knots in areas where orca occur. I agree with this conclusion and note that the easiest way to ensure implementation is for the farm operators to adopt a ≤12 knot speed restriction at all times and locations.

It is noteworthy that farm vessels will confer no greater risk of boat strike to marine mammals than any other marine users of the Waikato CMA, indeed farm vessels will present a lower risk than other vessels as skippers will be required to implement the specific recommendations outlined above.

4.6 Underwater Noise

Potential underwater noise effects from the construction of the proposed marine farm are discussed by Roberts (2023) in Section 4.6 who concludes that the installation of screw anchors will generate the highest noise levels during marine farm construction. I agree with this and note that Baltzer et al., (2020) characterised underwater noise from analogous installation activities in the Wadden Sea. This study reported a source level of 148 dB re $1\mu Pa.s^2$ which is low intensity compared to other types of coastal construction noise (e.g. pile driving) and was predicted to only elicit behavioural reactions in marine mammals within a localised radius (375 m) and noise levels were such that no physical effects (injury or hearing loss) would be expected. It is also noteworthy that screw anchor installation noise will be of short duration and intermittent in nature as the construction vessel will need to move frequently between anchor locations; these interludes between each screw anchor installation ensure a component of ‘recovery time’ for any individual marine mammal that may be in the area during the construction phase.

I note that vessel operational noise will also occur as part of both construction and the ongoing operation of the proposed marine farm. While frequent vessel presence at the farm sites, and farm vessel movement between Raglan and the farm sites will introduce underwater noise into the surrounding water column, vessel noise is typically low relative to other industrial underwater noise sources (MPI, 2013). The Waikato CMA is already subject to several anthropogenic noise inputs via commercial shipping and recreational boating. Therefore, marine mammals in this region are most likely accustomed to elevated ambient noise levels. Marine mammal responses to vessel noise are highly variable depending on species and the type of vessel but for odontocetes in the presence of small to medium vessels these responses range from avoidance (e.g. common dolphins: Neumann & Orams, 2006) to attraction (e.g. Hector's dolphins: Martinez, 2010).

I agree with the conclusion of Roberts (2023) that the effects of underwater noise from the construction and operation of the proposed marine farm will be (at most) <u>minor</u> for Māui dolphins and <u>negligible</u> for all other marine mammal species.

4.7 Cumulative Effects

Roberts (2023) discusses the potential for cumulative effects on marine mammals from the proposed marine farm in Section 4.7 and acknowledges the challenges associated with predicting such effects. In lieu of available quantitative tools to assess cumulative effects, most assessments adopt a qualitative approach. I concur that this is an acceptable approach with regard to the NWML application.

Being one of the rarest marine mammals in the world, it is particularly important to consider the potential cumulative effects on Māui dolphins. Roberts (2023) does an excellent job of summarising the known threats to this subspecies and is exceptionally well placed to do this given his previous involvement in developing the latest 'Spatial Risk Assessment of Threats to Hector's and Māui dolphins' (Roberts, 2019). It is noteworthy that Roberts (2019) only specifically addressed risks associated with aquaculture in terms of spatial overlap with dolphin populations, noting that at the time the report was written there was virtually no overlap between Māui's dolphin distribution and marine farming operations. Roberts (2023) concludes that for Māui dolphins "cumulative effects are difficult to assess from the available information and may be <u>at least minor</u>" on the basis that this was the greatest magnitude assigned for any single effects. This is a logical conclusion, and I am unaware of any additional information that would influence this finding. I do however note that by using the statement 'at least minor' Roberts (2023) suggests that there is a possibility that cumulative effects may have a significance level of more than minor. This point warrants further discussion.

With regard to other marine mammal species I note that killer whales, southern right whales, and humpback whales are also (i.e. in addition to Māui dolphins) considered to be Policy 11(a) species and that several recognised threats to marine mammals are present in the Waikato CMA, including disturbance or boat strike from other marine users, underwater noise, trophic effects from habitat degradation (e.g. climate change); land-based sedimentation, nutrient enrichment, exposure to contaminants, and reclamation/coastal development. However, no other aquaculture operations occur in the open waters of the Waikato CMA, hence cumulative effects on habitat availability will not occur on account of other marine farms in the region. I agree with the conclusion of Roberts (2023) that cumulative effects for these other species are unlikely to be more than <u>minor</u>.

5.0 Proposed Mitigations – Marine Mammals

As outlined by Roberts (2023) and in keeping with the findings of other reviews, the primary effects of aquaculture on marine mammals are the potential for entanglement and habitat exclusion.

Fundamental to the management of these primary risks is the adoption of best practice management, where the following mitigations are generally accepted to represent best practice (following Clement, 2013; MPI, 2013; NOAA, 2013; Aquaculture NZ, 2015; Price et al., 2017; Würsig, 2020; Fisheries NZ, 2021):

- Aquaculture sites should be carefully selected to avoid overlap with important marine mammal habitat;
- All ropes, lines and nets should be maintained under tension (i.e. no free or loose ropes/lines);
- Maintenance of aquaculture structures should be prioritised (e.g., keeping ropes/lines well tensioned, promptly repairing any damaged equipment etc);
- Anchor warps should be kept taut with no overlap underwater; and
- Operators should develop protocol to follow if a marine mammal becomes entangled.

In Section 6.1 of Roberts (2023) a list of mitigation measures proposed by NWML to minimise risks to marine mammals are outlined. Additional mitigation measures proposed by Roberts (2023) are also outlined in Section 6.2. In **Table 3** below I evaluate each of these mitigation measures, noting that in most instances these measures will need to be detailed in the yet to be developed MMMP and some may warrant inclusion as specific conditions. I also note that the proposed farm will be operated in accordance with the A+ Sustainable Management Framework for Greenshell Mussels (2015).

Table 3 Evaluation of Proposed Mitigation Measures

Proposed Mitigation	Evaluation Comments
1. Organising farm layout to include sufficient spacing between lines for dolphins to swim between them.	This is an important and relevant mitigation. I understand that line spacing will be 50 m which provides sufficient space for dolphins and killer whales to safely swim through the farm.
2. The use of pingers on the corners of each site to activate Māui's dolphin echolocation.	While pingers have shown promise at reducing bycatch in set nets for some small cetacean species that are wary of novel stimuli and that have large home-ranges (e.g. harbour porpoises, see Dawson et al., 2013), evidence is lacking to support their use in relation to Hector's and Māui's dolphin. In particular studies show that pinger use did not routinely result in displacement of Hector's dolphins and given their small home-ranges, rapid habituation would be expected (Dawson et al., 2013). Coupled with this, some commercially available pingers are unreliable (Dawson et al., 2013) and pingers increase noise pollution in the marine environment (Laverick et al., 2017). For some species pingers act as attractants and can attract dolphins from over 1 nm away. For these reasons I recommend that pingers are not used in association with the proposed farm unless further compelling justification of their use in relation to Māui dolphins can be

Proposed Mitigation	Evaluation Comments
	provided. I also note that the A+ Sustainable Management Framework for Greenshell Mussels (2015) recommends that acoustic deterrents are not used in association with mussel farms (see Appendix 3 of the framework).
3. Adequate tensioning of warps and backbones with hydraulic barge winches.	This is an important and relevant mitigation that aligns/exceeds aquaculture industry best practise.
4. Self-tensioning spat catching rope with added negative buoyancy.	I understand this will be used for all droppers to ensure they are tensioned and stiff and remain vertical through the water column. This is an important and relevant mitigation that exceeds aquaculture industry best practise.
5. Impregnating spat catching rope with lead core, to act as a sonar deflection mechanism as well as causing negative buoyancy.	This is an important and relevant mitigation that will enhance the ability of Māui's dolphin to detect lines in the water.
6. Regular infrastructure inspections and maintenance to ensure structural integrity.	This is an important and relevant mitigation that aligns with aquaculture industry best practise.
7. Deployment of best practices to minimise impacts from vessel activity.	Best practice in this regard will need to be defined in the MMMP. As a minimum, I would recommend the following to ensure compliance with the Marine Mammal Protection Regulations 1992: • Vessel operators shall endeavour not to disrupt the normal movement or behaviour of marine mammals; • Care should be taken not to separate any individuals from, or scatter any groups of marine mammals and no vessel shall proceed through a pod of dolphins; • No sudden or repeated change in the speed or direction of any vessel shall occur in the vicinity of marine mammals (except in emergency circumstances); • No vessel shall cut off the path of a marine mammal; • Vessels less than 300 m from a marine mammal shall move at a constant slow (no wake) speed. In the case of dolphins, vessels may exceed this speed in order to outdistance the dolphins but must increase speed gradually, and shall not exceed 10 knots within 300 metres of any dolphin; • No vessel shall approach within 50 m of a whale, and if a whale approaches a vessel, the vessel shall make every attempt to keep out of the path of the whale and to maintain a minimum distance of 50 m; and • No vessel shall approach within 200 m of a baleen whale or sperm whale with a calf.
8. Monitoring and reporting of marine mammal interactions.	This is an important and relevant mitigation that aligns with aquaculture industry best practise. Data collection of non-injurious marine mammal interactions (e.g. animals bumping or rubbing on farm structures etc) should also occur to help understand the broader context of interactions (i.e. not just injury or entanglement). In addition, marine mammal presence/absence should also be monitored and reported to facilitate increased understanding of how marine mammals utilise marine farms under different operating regimes and at different times of the year. It is

Proposed Mitigation	Evaluation Comments
	noteworthy that data relating to marine mammal absence is as important as data about marine mammal presence as absence data allows quantification of occurrence rates. Without absence records, data gaps could represent either an absence of animals or a lack of data collection. Marine mammal sighting records should be kept both at the farm sites and during transit to and from Raglan. Sightings should be reported as soon as possible to the Department of Conservation via the online 'Marine Mammal Sighting Form' available from: https://www.doc.govt.nz/marine-mammal-sighting-form. For any cetacean sightings, a photo/video should be taken to assist with species identification. The Marine Mammal Protection Act 1978 (s16) outlines the requirements for the reporting of any farm related marine mammal mortality.
9. Strict protocols to avoid marine debris.	I understand that all waste will be retained onboard and disposed at an appropriate facility onshore. This is an important and relevant mitigation that aligns with aquaculture industry best practise. The A+ Sustainable Management Framework for Greenshell Mussels (2015) includes specific content relating to reducing the likelihood that marine debris will enter the environment.
10. Ropes and lines should be monitored regularly to ensure that they are adequately tensioned.	This is a logical expansion of the requirement outlined in 6. above. I recommend that an inspection schedule is detailed in the MMMP and that it specifically includes a requirement with regard to farm components being suitably tensioned. I also note that the A+ Sustainable Management Framework for Greenshell Mussels (2015) states that farm structures and equipment should be maintained to avoid free, loose or floating lines or ropes capable of causing entanglement.
11. Ensure that anchor warps do not overlap or cross between farm blocks.	This is an important and relevant mitigation that aligns with aquaculture industry best practise.
12. Minimise the use of artificial lighting.	This is an important and relevant mitigation that aligns with aquaculture industry best practise.
13. Minimise underwater noise produced during the construction of farm structures and during operations.	This is an important and relevant mitigation that aligns with aquaculture industry best practise.
14. Compliance with Marine Mammal Protection Regulations 1992, specifically to regulations relating to at-sea contact with marine mammals.	This is a legal requirement. I note that the A+ Sustainable Management Framework for Greenshell Mussels (2015) requires that each farm vessel displays the rules for safe boating around marine mammals.
15. Increasing the vigilance of marine mammal monitoring around the proposed farm during months when southern right whales (July to November) and humpback whales (June and October) are most likely to be present off the West Coast of the North Island. The risk of entanglement for these species may, where possible, be	While I understand and agree with the intention of this proposed mitigation. I make the following comments: - The MMMP should stipulate that vessel operators remain vigilant for marine mammals during <u>all</u> proposed on-water operations. - Specific protocols that define and facilitate increased vigilance (over and above the baseline requirement above) should be outlined in the MMMP. - Extra vigilance' is also required with regard to vessel strike risk for Māui dolphins, see additional mitigation measures

Proposed Mitigation	Evaluation Comments
further reduced by avoiding the deployment of dropper lines when these species are most likely to be present.	listed below this table.

Several additional mitigation measures were stated by Roberts (2023) in Sections 4 and 5 that were not included in the mitigation measure lists he provided in Sections 6.1 and 6.2. Specifically, the following mitigation measures are also required to manage the potential marine debris and vessel strike effects to acceptable levels:

- High-quality UV stabilised rope products should be used on the farm;
- Farm vessel speeds must be restricted to ≤ 12 knots in areas where Māui dolphins are most likely to occur and especially between Raglan and Site D which is where most sightings of groups containing juveniles have been reported from;
- Farm vessel speeds must be further restricted to ≤10 knots or the speed of the slowest marine mammal when within 300 m of Māui dolphins;
- Extra vigilance will be required during the Māui dolphin breeding period of November to February.
- Farm vessel speeds must not exceed 12 knots in areas where killer whales occur.

As per my earlier comments, and to reduce confusion, I strongly recommend that the ≤12 knot speed restriction be adopted at all times and locations by farm vessels while engaged in activities associated with the proposed marine farms.

Roberts (2023) also recommended the adoption of a staged approach to farm development which would allow Māui dolphin presence around those farm sites established first to be monitored prior to the establishment of subsequent sites (in particular of Site D which perhaps represents habitat that is most suitable for mother/calf pairs). I concur with this recommendation and note that indicators of concern should be pre-defined in the MMMP. Monitoring results from the initial stages should be evaluated against these indicators before full farm development can proceed.

I also note that all rope used for warps, backbones and droppers will be of 40 mm or greater diameter. This is encouraging on the basis that increased rope diameter is a relevant mitigation as studies of cetacean entanglement have reported that thin ropes presented a significantly higher risk of entanglement (NZRLIC, 2022).

As stated by Roberts (2023) a detailed MMMP will need to be developed in consultation with DOC before farm development can commence. The MMMP will need to define all elements of best practice and include operational detail about how all proposed mitigation measures will be implemented. In addition to the proposed MMMP contents listed by Roberts (2023), the MMMP should include the following additional detail:

- Inspection schedules to ensure regular maintenance of farm structures;
- Requirements for safe vessel operation around marine mammals, including speed restrictions as previously discussed;

- Protocols for 'increased vigilance' for baleen whales during the migration season/s and for Māui dolphins during the breeding season;
- Recording and reporting requirements and data management. Including the requirement for the collection of 1) 'absence' data; 2) reports of non-injurious interactions; and 3) sightings data both at the farm sites and during transit to and from Raglan; and
- Farm staff training requirements in relation to the MMMP obligations and any statutory considerations (see **Section 6.0**).

5.1 Māui dolphin monitoring opportunities:

Roberts (2023) makes several recommendations for additional monitoring of Māui dolphins, as follows:

- Passive Acoustic Monitoring (**PAM**): I agree that the farm structure could provide a useful platform from which acoustic monitoring could be undertaken. Establishing any temporal patterns of Māui dolphin distribution around the four farm sites would be valuable in terms of understanding any temporal component to entanglement risk and in order to better define periods during which increased vigilance may be warranted in the context of farm operations. PAM data would also generally add to our understanding of patterns of distribution for this subspecies. I note however, that I am not an acoustician, so further advice from a specialist in this field should be sought; and
- Toxoplasmosis Sampling: I agree that the analysis of mussel samples from the farm sites would be useful for determining the seasonal and spatial distribution of *T. gondii* oocysts in the water column and for the potential genetic identification of source populations.

These monitoring projects represent excellent opportunities to collect data on this critically endangered subspecies.

6.0 Statutory considerations

The relevant statutory considerations under the Resource Management Act 1991 include:

- New Zealand Coastal Policy Statement
- Operative Regional Coastal Plan (2005, last updated July 2012).

Having reviewed the relevant provisions of the above-referenced documents with regard to marine mammals, I conclude that the application aligns with the provisions outlined therein.

I note that the Waikato Regional Policy Statement (2016), however requires (under Coastal Environment Policy 2: CE-P2) that adverse effects to 1) habitats of indigenous species that are listed as threatened and 2) areas set aside for full or partial protection of indigenous biological diversity under legislation (including the West Coast North Island Marine Mammal Sanctuary) are avoided. I consider that this warrants further consideration as to whether minor adverse effects (as determined by Roberts (2023) and reiterated in this report) are acceptable under this policy.

Other relevant statutory considerations pertain to the Wildlife Act 1953 and the Marine Mammal Protection Act 1978. Having reviewed the relevant provisions of these acts, I conclude that while under both instruments of legislation it is an offence to 'disturb' marine mammals. I note that with the proposed mitigations in place, only low levels of disturbance are predicted from the proposed activities and that no effects of ecological significance are predicted. No additional approvals are required under the Wildlife Act 1953 or the Marine Mammal Protection Act 1978.

7.0 Closure

Overall, I conclude that, subject to conditions and commentary related to cumulative effects, the actual and potential adverse effects of the proposal will be no more than minor. In particular, adverse effects on threatened marine mammal species can be avoided as required by the NZCPS, and significant effects on habitats that are important during the vulnerable life stages of indigenous species are not predicted.

Overall, I agree that the methodology used is appropriate and is reflective of best practise with regards to assessments of effects for similar projects within New Zealand.

In my opinion, no further information is required to ensure a robust assessment of effects on marine mammals; however as outlined through this report there are several areas where additional discussion is warranted, and the information presented to date should be expanded upon.

Sincerely,

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8.0 Feedback

At SLR, we are committed to delivering professional quality service to our clients. We are constantly looking for ways to improve the quality of our deliverables and our service to our clients. Client feedback is a valuable tool in helping us prioritise services and resources according to our client needs. To achieve this, your feedback on the team's performance, deliverables and service are valuable and SLR welcome all feedback via https://www.slrconsulting.com/en/feedback. We recognise the value of your time, and we will make a $10 donation to our 2023 Charity Partner - Lifeline, for every completed form.

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Appendix A Central West Coast, North Island IMMA

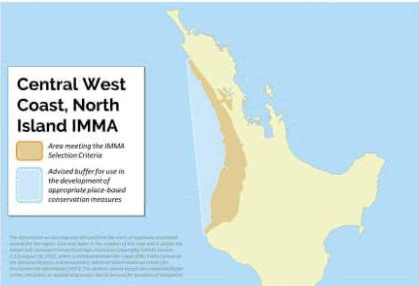
Peer Review of Marine Mammal Assessment

North Western Mussels Ltd - Resource Consent Application

Waikato Regional Council

SLR Project No.: 840.030063.00001

17 August 2023



Area Size

19,785km^2

Qualifying Species and Criteria

Māui dolphin – *Caphalorhynchus hectori maui*

Criterion A, B1

Marine Mammal Diversity

Delphinus delphis, Tursiops truncatus, Orcinus orca

Summary

These nearshore waters, delineated by the 100m depth contour encompass the New Zealand West Coast North Island Marine Mammal Sanctuary and includes the coastal harbours. These turbid waters are the preferred habitat for endemic *Cephalorhynchus* dolphins. The area encompasses the known current habitat of the IUCN Red Listed Critically Endangered Māui dolphin and protects the important potential for distribution of the sister-taxa, Hector's dolphins (listed as Endangered by IUCN) from the South Island. The area is also used by transient common bottlenose dolphins and killer whales. Common dolphins use the more offshore waters for feeding (although occasionally are closer to shore if there are schooling fishes inshore). They are subject to fisheries bycatch pressure in particular off this coast including northern Taranaki waters.

Central West Coast, North Island IMMA

Description:

The central west coast of the North Island of New Zealand encompasses open, coastal waters with high levels of turbidity punctuated by a number of harbours. This is the core habitat for the Māui dolphin (*Cephalorhynchus hectori maui*) (Baker et al. 2002) listed by the IUCN as Critically Endangered, a subspecies whose range is now mainly restricted to a ~250km stretch of coastline between south of Kaipara Harbour and north of Raglan (Constantine et al. 2021). The sub-species' range has been significantly reduced as a result of bycatch in fisheries (Dawson et al. 2001). These dolphins favour turbid waters (Derville et al. 2016; Roberts et al. 2019a) and are exposed to risks from fishing activities (although these have been reduced with the West Coast Marine Mammal Protected Area and recent increases in set-net and trawl fishing restrictions) and disease (summarised in Roberts et al. 2019a, Roberts et al. 2019b). Harbours are rarely used by Māui dolphins now but were once important habitat (Rayment et al. 2011). The harbours along this coast are used by common bottlenose dolphins and killer whales (R. Constantine, unpublished data). The most recent Māui dolphin abundance estimate was 54 (95% CI = 48-66) dolphins aged 1+ (Constantine et al. 2021).

Figure 1 – Māui dolphin mothers and calves. Photo: University of Auckland & Department of Conservation

Figure 2 – Māui dolphin dorsal fin
Photo: Department of Conservation New Zealand/University of Auckland

The turbid waters from the harbour outflows and alongshore coastal erosion form primary habitat for Māui dolphin (Derville et al. 2016, Roberts et al. 2019a). The dolphins' preferred prey are small demersal and benthic fishes (Miller et al. 2013) in particular, ahuru and sole (Roberts et al. 2019a; Ogilvy et al. 2022). This IMMA incorporates feeding grounds for common dolphins particularly in the northern Taranaki region where they prey on pelagic schooling fishes such as Jack mackerel, an important fishery in the region but one that results in dolphin bycatch (Abraham et al. 2017). Common dolphins also use the nearshore coastal waters.

Recently, individuals assigned to the other subspecies of *C. hectori*, which bears the same common name as the species (which is red-listed as Endangered by the IUCN), have been observed in the primary habitat of Māui dolphins with individuals originating from the east and west coasts of the South Island (Hamner et al. 2014, Constantine et al. 2021). There are no estimates for bottlenose dolphins or killer whales in the IMMA but the killer whales form part of a wider-ranging New Zealand population (Baker et al. 2019) and at least some of the bottlenose dolphins are part of the northeast coast North Island population (R. Constantine, unpublished data). The common dolphins are part of a wider-ranging population found in offshore west-coast waters. They are vulnerable to fisheries bycatch but there is no current abundance estimate for this region (Abraham et al. 2017, Stockin et al. 2014, Stephenson et al. 2020).

Criterion A: Species or Population Vulnerability

This IMMA includes the only currently occupied year-round habitat of Critically Endangered (IUCN Red List) Māui dolphins (Oremus et al. 2012, Derville et al. 2016, Constantine et al. 2021, Roberts et al. 2019a). Their current range is extremely limited compared to their historical range (Dawson et al. 2001). Māui dolphins have been isolated by ~15,000 years from the South Island Hector's dolphins (Baker et al. 2002) and their unique haplotype most likely resulted from a population bottleneck and small home range (Oremus et al. 2012, Pichler & Baker 2000). Their core range has decreased since the 1970s (Russell 1999, Constantine et al. 2021).

Criterion B: Distribution and Abundance Sub-criterion B1: Small and Resident Populations

The entire known range of the Māui dolphin is included in this IMMA. This is a small population (54 dolphins aged 1+ 95% CI = 48-66) facing threats from disease and fisheries bycatch (Constantine et al. 2021, Cooke et al. 2018, Roberts et al. 2019a; Roberts et al. 2021). Individuals have small home ranges averaging

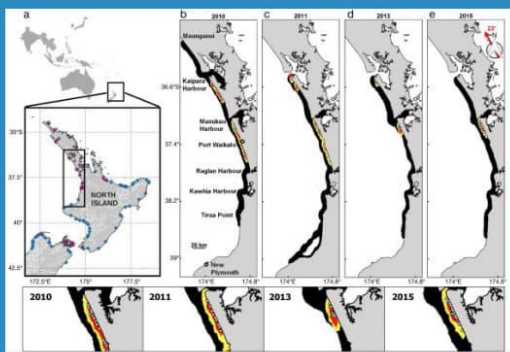


Figure 3 - Kernel density estimate contours and Māui dolphin sightings from 2010-2015 dedicated surveys. From Derville et al. (2016).

35.5 km, with a maximum range of 80 km recorded for one individual (Oremus et al. 2012). A genetic and photo-identification database has identified dolphins up to 20 years after their initial identification highlighting long-term site fidelity. In 2010, there were two female Hector's dolphins genetically identified swimming with Māui dolphins within this IMMA; one of the females was identified again in 2011 and 2020 so remained with the Māui dolphins (Hamner et al. 2014; Constantine et al, 2021). This was considered an extraordinary event, but in 2015 and 2020, two different male Hector's dolphins were also genetically identified with Māui dolphins suggesting long-range movements by Hector's dolphins from the South Island may become a more regular occurrence (Constantine et al. 2016). Surveys have been mostly conducted in summer months when neonates and calves have been observed. Groups containing calves are larger than non-calf groups. These nursery groups contain male and female adults which differs from Hector's dolphins (Oremus et al. 2012).

Supporting Information

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Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

based on a decision of the German Bundestag

We would like to thank the participants of the 2020 IMMA Regional Expert Workshop for the identification of IMMAs in the Australia, New Zealand and South East Indian Ocean seas region. Funding for the identification of this IMMA was provided by the Global Ocean Biodiversity Initiative funded by the German government's International Climate Initiative (IKI). Support was also provided by Whale and Dolphin Conservation and the Tethys Research Institute.

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PDF made available for download at: https://www.marinemammalhabitat.org/portfolio-item/central-west-coast-north-island-new-zealand/

Making Sustainability Happen

Re: Further information for NWML application - marine mammals - Message (HTML)

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Re: Further information for NWML application - marine mammals

JR Jim Roberts <s 9(2)(a)
To Rebecca Clarkson

Reply | Reply All | Forward

Wed 29/11/2023 9:59 am

Follow up. Start by Wednesday, 29 November 2023. Due by Wednesday, 29 November 2023.
You forwarded this message on 29/11/2023 2:50 pm.

Hi Rebecca,

Thank you for sending through the peer review report by Helen McConnel. I have read through this and think that she did a great job. I certainly would not contest anything that she has said.

With respect to the wording of my assessment of cumulative effects on Maui dolphin, I stated that "cumulative effects are difficult to assess from the available information and may be at least minor".

In retrospect, this was a woolly wording, which I used at the time to reflect an almost total lack of quantitative information about cumulative effects on this population, the wider species, and marine mammals in general. A standard approach in this situation has been to assume the maximum effect level for any single threat, which for Maui dolphin, would have been minor, according to my assessment.